



PHILADELPHIA'S SHARE IN THE DEVELOPMENT OF PHOTOGRAPHY.

BY MR. JULIUS F. SACHSE.

[A lecture delivered before the Franklin Institute, December 16, 1892.]

The lecturer was introduced by the Secretary of the Institute and spoke as follows:

MR. PRESIDENT, MEMBERS OF THE FRANKLIN INSTITUTE,
LADIES AND GENTLEMEN :

It is well-known to most persons that photography is, with the exception of the art of printing, the most widely disseminated art-science throughout the world.

Within a few decades, modern photography has penetrated into every quarter of the known world; and the vast space within the limits of the lately explored ice cap of Greenland to the tropical jungles of equatorial Africa, has been conquered and brought into subjection in the interest of general information by the modern dry-plate and the perfected lenses of the present day.

It is but a little over half a century, or, to be exact, just fifty-three years ago, when the first account of Daguerre's process reached America by the slow and uncertain methods of communication of the day. And when the news arrived it was published, only to be received by nearly everyone with suspicion and ridicule; and the whole matter was set down by scientist and scholar as another grand hoax, similar to the one sprung upon the scientific world a few years before in connection with Herschel's great telescope.

However, the doubt and uncertainty were soon dispelled by a member of this institution, after which the development of the process was rapid and steady.

Although it is but a question of half a century, few persons at the present day are aware that photographic portraiture is a Philadelphia invention, or how great is Phila-

delphia's share in the development of photography, and that the present perfect state of universal photography was brought about mainly by Philadelphia investigators and experimenters, their efforts being fostered by two of Philadelphia's scientific institutions; the first of these, the American Philosophical Society, the oldest and then most active and important scientific society in America; the other one, though in its comparative infancy, lacked none of the vigor of its more mature rival, and now after an active life of almost three-fourths of a century stands as an acknowledged scientific centre in the world. I allude to the Franklin Institute.

Daguerre, after the first promulgation of his process, and the vote of a pension by the French Chamber of Deputies, never did anything towards the improvement of his invention. It was left to the experiments of others to give the process a practical and commercial value.

To a Philadelphia scientist is due the improvement to Daguerre's process as originally promulgated, which made its universal application possible, and in reality forms the basis of the whole photographic structure of to-day. I have reference to the application and use of bromine as an accelerator by Dr. Paul Beck Goddard, of Philadelphia.

In connection with this subject, I will advance the following claims for Philadelphia in the development of photography, viz:

(1) That Joseph Saxton, of Philadelphia, made the first heliograph in America, October 16, 1839.

(2) That Robert Cornelius, of Philadelphia, and a member of the Franklin Institute, obtained the first picture of a human face ever taken by Daguerre's process, November, 1839.

(3) That to Dr. Paul Beck Goddard, of the faculty of the University of Pennsylvania in Philadelphia, belongs the honor of the discovery of bromine as an accelerator, December, 1839.

(4) That Dr. Paul Beck Goddard, of Philadelphia, was the first person in the world to obtain an instantaneous picture by heliography, December, 1839.

(5) That William G. Mason, of Philadelphia, obtained the first perfect picture in the camera by aid of artificial light, December, 1839.

(6) That the first portrait studio in America, or more strictly in the world, was opened in Philadelphia, February, 1840, by Robert Cornelius, at the northeast corner of Eighth Street and Lodge Alley.

(7) That the first heliograph ever entered for exhibition was one by Dr. Joseph E. Parker at the tenth exhibition of the Franklin Institute, held in October, 1840, at the old Masonic Hall, in Philadelphia.

(8) That Joseph Saxton, of Philadelphia, in 1841, produced the first photo-mechanical reproduction for use with printer's ink, which combined in its production the daguerreotype, electrotype and a mechanical process.

(9) That the first successful attempts at interior photography were made by Dr. Paul Beck Goddard, January, 1840, at the Academy of Natural Sciences, at the southeast corner of Twelfth and Sansom Streets. The originals are still in existence.

I will further state the daguerrean portraiture had actually ceased to be a novelty in Philadelphia long before the process was even introduced elsewhere in this country, or was practised in Europe.

To establish this fact, it is but necessary to refer to the *Public Ledger*, of October 12, 1840, where in the account of the tenth exhibition of the Franklin Institute, then in progress, it states:

"Throughout the room are various specimens of the daguerreotype. They consist chiefly of miniatures."

The first authentic account of Daguerre's process to reach America was a letter written in Paris and sent to Alexander D. Bache, a member of the Philosophical Society and of this Institute. This letter, which embodied the whole secret, then first made public, was published in the *United States Gazette*, September 25, 1839, with an introduction in which it was stated that some steps of the process are not explicable by known laws. This account set forth the crude process of Daguerre, as first publicly announced to the Chamber of

Deputies, in Paris, August 19, 1839. It was republished in the *Journal of the Franklin Institute*, for September, 1839, without a word of notice or comment. This was followed in the next *Journal* (October, 1839, p. 287), with an account from Galignani of three street scenes in Paris, taken from Daguerre's atelier, which were exhibited before the Chamber of Deputies at a meeting subsequent to the one held August 19th.

Notwithstanding these repeated notices of the heliographic process, no action whatever was taken upon the subject by any scientific institutions, the published accounts thus far being looked upon as unworthy of serious consideration.

A few weeks later, however, a more detailed account reached America; this was from an eye-witness, who was a special correspondent of the *New York Star*. It was published October 14, 1839, and gave an account of the public demonstration given by Daguerre on the 17th of September at the Grand Hotel, on the Quay d' Orsay.

So skeptical were the Parisians of Daguerre's claims, and so great was the popular opposition to the grant made by the deputies to the inventor, that to silence public clamor the Minister of the Interior ordered Daguerre to give three public demonstrations of his process so that the interested public might judge whether the deputies were justified in pensioning Daguerre for the disclosure of his process.

This account was reprinted in the *American Daily Advertiser*, October 16, 1839. So crude was Daguerre's method, as shown by this account, that the time occupied to produce this single picture was one hour and twelve minutes.

Among those whose notice was attracted to the publication of Daguerre's process was one Joseph Saxton, an attaché of the United States Mint in this city, a man of culture and great scientific accomplishments. When Saxton read this account as published, it seemed so clear and feasible, that he at once concluded to try the process according to the directions set forth in the newspaper.

A cigar-box was improvised as a camera, while an ordi-

nary burning glass, consisting of a convex lens, was fixed in one end and made to do duty as an objective. A pasteboard seidlitz-powder box, containing some flakes of dry iodine, and a cut-out in the lid somewhat smaller than the plate answered the purposes of a coating box. For a mercury bath, the ingenious experimenter mortised a block of hard wood, attaching underneath a globular bottom of sheet iron, so as to hold the quicksilver and allow the application of a spirit lamp beneath. A piece of polished silver



Fac-simile of the first daguerreotype (heliograph) made in America, by Joseph Saxton from window of Mint, October, 1830.

ribbon, such as coin blanks are cut from, served in lieu of the copper plates.

When all these preparations were completed, the ingenious Saxton set his apparatus on the window-sill of one of the second story north windows of the Mint, and pointed it northeastwardly toward the sunlit buildings beyond. After the exposure, the instructions in the newspaper were followed to the letter amidst the ridicule of the other attachés who were present, but, to the great surprise of the latter, and the joy of the experimenter, the attempt resulted in a perfect picture. There, permanently impressed upon the silver plate, was the picture of the old Philadelphia High

School and the State Arsenal, which then stood upon the site.

Joseph Saxton had proved the truthfulness of the published account of Daguerre's invention, and had made the first heliograph in America. On the next day, Saxton succeeded in making several other pictures of different buildings, all of which were taken from the same window.



Fac-simile of what is believed to be the first portrait ever made by the daguerreotype process. Taken by Robert Cornelius, in Philadelphia, November, 1839.

To Robert Cornelius, of Philadelphia, is due the honor of having produced the first successful portrait of any living person by the Daguerre process. This was accomplished in the yard back of his store and residence, (old) 176 Chestnut Street, above Seventh (now number 710), in Philadelphia.

How Robert Cornelius, who was a lamp-maker and a metal-worker, became interested in Daguerre's invention, is best told in his own words to the speaker, viz:

"Mr. Saxton, who was then connected with the United States Mint, had the opportunity of receiving an early notice of the manner in which Daguerre was operating. He soon produced a picture from the second story of the Mint—a view of chimneys and tops of houses. He was anxious to continue the experiment and called upon me, and showed his experiment, explained to me the manner of doing it, and desired me to prepare some plated metal to experiment with. With pleasure I complied with his request. It was our business to make a great variety of articles of plated metal. Very soon afterwards, I made in the factory a tin box, and bought from McAllister, 48 Chestnut Street, a lens about two inches in diameter, such as was used for opera purposes. With these instruments I made the first likeness of myself and another one of some of my children, in the open yard of my dwelling, sunlight bright upon us, and I am fully of the impression that I was the first to obtain a likeness of the human face."

In a subsequent communication in reference to this picture, Mr. Cornelius writes, viz :

"You will notice the figure is not in the centre of the plate. The reason for it is, I was alone, and ran in front of the camera after preparing it for the picture, and could not know until the picture was taken that I was not in the centre. It required some minutes with iodine to produce the effect."

This achievement of Robert Cornelius, a member of this society, is all the greater when it is considered that at that time, in Europe, it was considered impossible to apply the Daguerrean process to the production of portraits; for, with the chemicals and apparatus there employed, no picture could be taken in less than about a quarter of an hour, and as the correctness of a portrait produced by this art depends upon perfect immobility during the whole sitting, the mere idea of such an application of photography was looked upon as altogether absurd.

This statement will be found in the *Franklin Institute Journal*, vol. x, p. 50.

Unfortunately the exact date of this successful experiment at portraiture has not come down to us, nor is Mr. Cornelius able to recall it with certainty. That it was not long after Saxton's experiment is, however, proven by the fact that one of the pictures was shown by Robert Patterson, a director of the Mint at the regular stated meeting of the American Philosophical Society, December 6, 1839, and the fact is so recorded upon the minutes (*Proc. A. P. S.*, vol. i, p. 155).

It was not until a month later that the first French daguerreotype reached America. This was obtained in Paris by Mr. Henry Seybert and sent to the Philosophical Society in Philadelphia, and was shown at the regular meeting, January 3, 1840 (*Proc. A. P. S.*, vol. i, p. 169).

A comparison with Saxton's early efforts showed that they were equal, if not superior, to the French specimen, while Cornelius' and Goddard's efforts were far in advance of the French production.

The month of December, 1839, was destined to prove a memorable one in the development of the heliographic art.

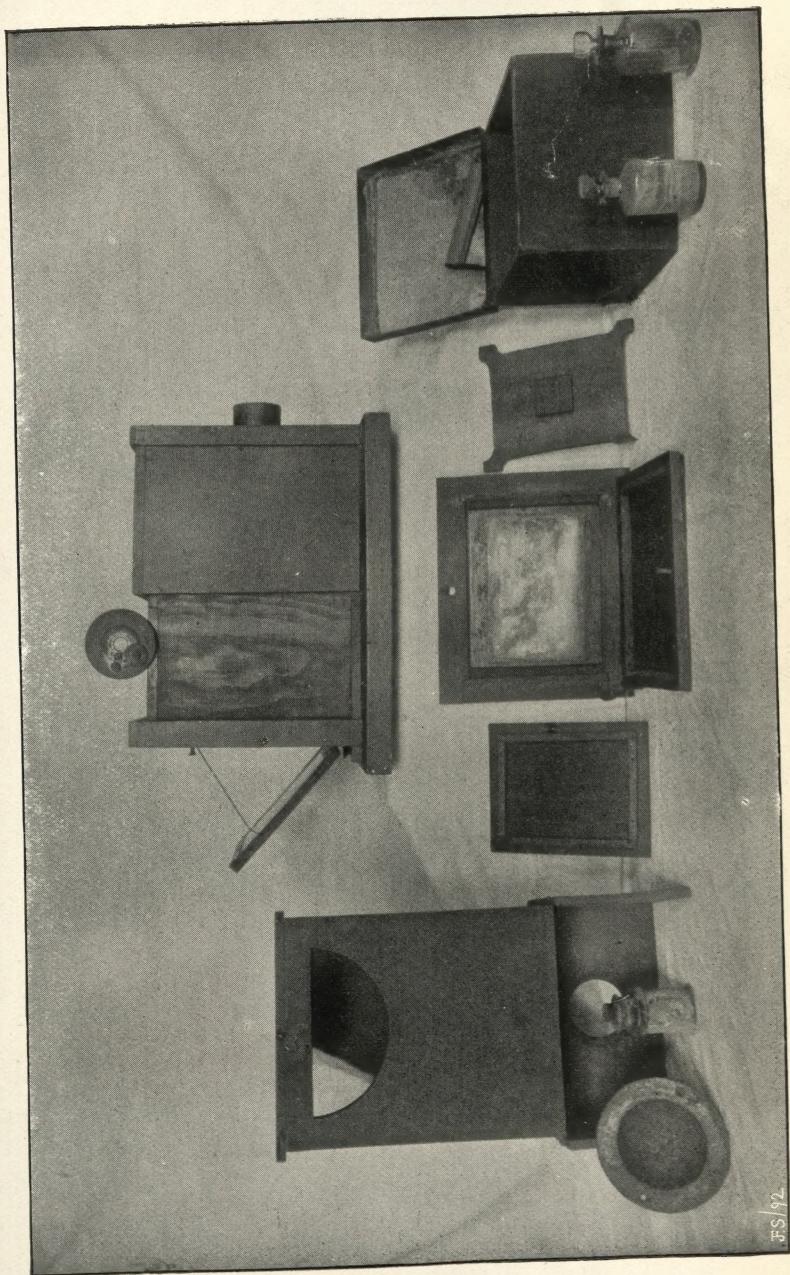
It was during this month that the most important improvement was made upon Daguerre's process. This was the application of bromine as an accelerator, by Dr. Paul Beck Goddard, of Philadelphia. It was this discovery which solved the question of time exposure, perfecting Daguerre's process and thereby making possible its universal application in the various arts and sciences.

The proof of Dr. Goddard's claim to priority in the use of bromine is to be found in the *Proceedings of the American Philosophical Society*, vol. iii, p. 180.

The experiments of Dr. Goddard, in December, 1839, resulted in the production of a perfect specimen by the use of bromine, and was subsequently shown at the Philosophical Society. It was during this series of experiments with bromine that Dr. Goddard succeeded in obtaining several good views instantaneously in the open air, which were the first instantaneous pictures ever made by any heliographic process.



(*Sachse.*)



STUDIO OUTFIT OF DR. PAUL BECK GODDARD, PHILADELPHIA, 1840.

- Fusing box ready for use, with glass to view process during development. Brass spirit lamp.
- Lens and Shutter.
- Camera with body extended showing mirror set for focusing.
- Plate holder, with original coated plate back, for exposure.
- Coating box, with rake to distribute chemicals on tray.
- Diffuser for Vapor.
- Tray chemicals used in coating plates.
- Iodine bottle.
- Mercury bottle.

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(Sachse.)



The eleventh annual exhibition of the Franklin Institute, held at Chinese
Museum, N. E. corner Ninth and Sansom Streets, October, 1842.
Daguerreotype by Dr. Paul Beck Goddard. Negative
from original by Julius F. Sachse.



The First Studio.—Spurred on by his success in experimental portraiture, Robert Cornelius, together with Dr. Goddard, devoted considerable time to heliographic experiments, and the application of the process to portraiture. These progressed so satisfactorily that early in the year 1840 Mr. Cornelius secured the second story room in the building at the northeast corner of Eighth Street and Lodge Alley (now Jayne Street) above Chestnut. This was arranged exclusively for daguerrean portraiture, thus making it the first heliographic studio in the world.

The method employed to concentrate light upon the sitter consisted in a series of reflectors, set at different angles, together with the use of blue glass to screen the sitter. The time for a sitting averaged about one minute. It is an interesting fact that the first apparatus, such as the camera, plates, mats, coating boxes, etc., were all made by Mr. Cornelius personally. The lenses he obtained from McAllister, the Philadelphia optician.

In connection with this subject I have here a copy of the first successful studio picture, the father of the speaker, taken by Mr. Cornelius in his new establishment.

The original is a representative specimen of his skill and proficiency, and its perfect condition at the present day attests the permanency of his early efforts.

Considerable success attended Mr. Cornelius, a leading feature being an increase in the size of the image. Thus on March 6, 1840, we again find a notice of his progress chronicled in the *Proceedings of the Am. Philosophical Society*.

"Dr. Patterson exhibited some specimens of the heliographic art (daguerreotype) of a large size, executed by Mr. Robert Cornelius, of Philadelphia, and stated to the society that Mr. Cornelius had succeeded in obtaining beautiful representations upon highly-polished silver plate." (*Proc. A. P. S.*, vol. i, p. 181.)

Mr. Cornelius' enterprise attracted much attention among the wealthy and scientific classes, and brought many sitters to the establishment.

An interesting item for the professional photographer of to-day who furnishes a dozen cabinets for \$1, or who turns

out thirty-six tintypes for a quarter, is, that so great was the rush for the daguerrean miniatures, as they were called, that prospective sitters had to be "booked" a week ahead, at \$5 for each sitting. Each received his day and hour, subject, of course, to sunshine. No sittings were attempted in cloudy weather.

About a year after the "atelier," at Eighth and Lodge Alley, was established, Mr. Cornelius removed his estab-



Fac-simile of the first successful studio portrait, made by Robert Cornelius, 1840.

lishment to larger quarters on the south side of Market Street. His announcement in the *Public Ledger*, of July 1, 1841, reads, viz:

"Daguerreotype Miniatures.—R. Cornelius respectfully announces that he has resumed the taking of daguerreotype miniatures, and invites the public to call at his rooms, No. 270 Market Street" [now 810], "where specimens of the art can be seen. The recent improvements are such that minia-

tures can be made in the shade and without regard to the state of the weather."

The last positive record we have relating to Cornelius as a professional heliographer is the entry upon the minutes of the stated meeting of the American Philosophical Society April 15, 1842, stating :

"Mr. G. W. Smith presented some daguerreotype portraits made by Mr. Cornelius by an improved process, an important part of which was the greater polish given to the plate, and the absence of cross lines."

The splendid results obtained by Cornelius, Goddard and others in Philadelphia, gave the art-science that impetus which has since placed it among the indispensable arts of the present day.

Another application of the heliographic art, which has now reached enormous proportions, viz: that of mechanical reproductions for printing purposes, is also due to Philadelphia scientists. The first photo-mechanical reproduction ever made was one by Joseph Saxton, to illustrate a Philadelphia book in the year 1841, viz: Eckfelt and DuBois' *Manual of Gold and Silver Coins*. It is a view of the Mint, and appears on the title-page. We reproduce a copy here-with.

Commenting upon it, the authors state :

"To obtain the vignette of the Mint (which is on the title-page), as there was no medallion to rule from, it was required to go back to the original, and this necessarily brought into play another brilliant invention of modern times, the daguerreotype. A picture of this edifice was taken with this instrument by Mr. Saxton, from which a copy was engraved in soft metal by Mr. Gobrecht; from this copy a counterpart was obtained in copper by the electrotype, and therefrom the engraving was effected. This view is therefore commended to the reader, not only as a faithful transcript of the original, but as combining in its production three discoveries which adorn the present age, the daguerreotype, electrotype and machine engraving."*

* *Manual of Gold and Silver Coins*, Philadelphia, 1842, p. 189.

The first published record of interior photography appears in a notice of a series of views taken of the thirteenth exhibition, held October, 1844, at the Chinese Museum. For some reason the Institute Committee failed to take any notice of these views; not so, however, with the reporter of the *Ledger*, wide-awake as the news-gatherer of the present day. A note was made of the novelty and on October 25, 1844, appears the following notice, viz:

"In the southwest corner of the gallery, W. & F. Langenheim have their daguerreotype apparatus, with a number of excellent specimens of their work. They have several daguerreotype views of the exhibition, taken from favorable points, which look very well, and are, of course, accurate, but unavoidably left-handed."

As early as the next year, 1845, the Messrs. Langenheim made some excellent instantaneous views of America's greatest natural wonder, Niagara Falls; specimens which for beauty of finish and execution have never been surpassed. Copies of this effort were sent to Daguerre, to the President of the United States, and to various crowned heads of Europe.

In return Daguerre sent the following characteristic note, one of the few written by him in the first person and signed by his name:

À Monsieur le Consul de France à Philadelphie.

MONSIEUR:—I profit with great satisfaction by the return of Mr. Martin to America to thank you for your kindness in sending me the charming view of Niagara, which is due to the amiable attention of Messrs. Langenheim. Besides the merit of these proofs of execution they have also the merit to represent one of the wonders of the known world.

I beg of you sir, to be my interpreter with the Messrs. Langenheim by tendering them all my gratitude.

I repeat to you sir, my thanks, and I pray you to accept this expression of my regards.

DAGUERRE.

Bry-sur-Marne, le 30 Juin, 1846.

The King of Saxony complimented the Philadelphia daguerreotypists by sending a note of thanks and a medal.

Frederick of Prussia accompanied his thanks by the great gold medal for art.

The King of Wurtemburg also sent a gold medal.

Queen Victoria through Lord Aberdeen, sent the following note :

I have now the pleasure to acquaint you, that, although it is a general rule with her Majesty not to receive presents from any quarter, her Majesty has been graciously pleased to accept this view of the falls of Niagara and express her admiration at the great skill with which it has been taken.

[SIGNED]

ABERDEEN.

We now come to the next period, which marks the greatest advance in the history of the photographic progress, viz : the advent of glass negatives and positives, first applied to lantern slides and stereoscopic views, in the development of which none hold a more honorable position than Francis Schreiber and the two Langenheim brothers. The same may be said of the printing of positives from glass negatives.

In substantiating this claim for Philadelphia, I will quote from the *London Art Journal*, for April, 1851, p. 106, a report which was written by no less an authority than Robert Hunt: "Our attention has been especially excited by some specimens of photographic positives on paper, from glass negatives, which will be exhibited in the Palace of Industry (they are from Philadelphia), to which the inventors have given the names of hyalotypes. In the hyalotype, both the positive and negative impressions are obtained on glass, and the result is as near an approach to perfection as we can imagine. The hyalotype is the invention of Messrs. W. & F. Langenheim, of Philadelphia—these gentlemen state 'We have substituted plate glass for paper in the negative, and also in the positive altering the process to suit the new material.'"

Robert Hunt continues and says :

"The most interesting application of this discovery is the construction of magic lantern slides, taken from nature by the camera-obscura, without the aid of pencil or brush." Hunt then goes on to describe some of the specimen slides, nearly all of which were local Philadelphia subjects, such as "The Spring Garden Hall," "The U. S. Custom House." There was a total of 126 views and portraits in this collection. He further states that the colors of these pictures also

show a peculiarity in the process of the Messrs. Langenheim. We have them of a rich warm brown, a deep sepia and many of them intensely black, showing that the art of toning was known to these Philadelphia artists long before it was practised elsewhere.

At the great London Exhibition of 1851, the Philadelphia heliographers were awarded the medal over all competitors, a fact of which they were advised by an autograph letter of Millard Fillmore, the President of the United States.

These same artists were also the first to attempt the publication of a series of stereoscopic views of American scenery.

In connection with this venture the following card appeared in the *Public Ledger*, during December, 1855:

Langenheim's New Series of American Stereoscopic Views.—We, the undersigned, who by subscribing and furnishing F. Langenheim with the means to commence a new series of American stereoscopic views between Philadelphia and Niagara Falls, have received the number subscribed for, and take pleasure in expressing our entire satisfaction with them, and would recommend them to all who have a desire to cultivate a taste for their own American works of art and skill. They are also colored with much taste and truthfulness to nature.

JOHN TUCKER,
R. D. CULLEN,
H. J. WILLIAMS,
CHARLES VEZIN,
JAMES FARNUM,
JAMES R. GRAVES,
M. J. LEWIS,
C. GULLUC,
J. H. TOWNE,
FAIRMAN ROGERS,

THOMAS C. KIRKBRIDE, M.D.
SAMUEL SLOAN
J. C. CRESSON,
LYON J. LEVY,
JOSHUA BAILY,
SAMUEL MASON,
JEREMIAH HACKER,
THOMAS C. JAMES,
JAMES L. CLAYBORNE,
CHARLES C. GRUGAN,

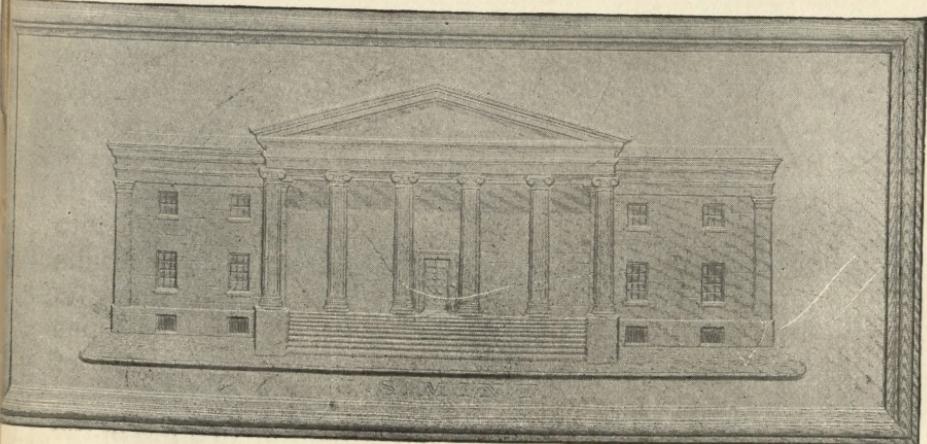
M. L. DAWSON.

"A Card."—The new series of American stereoscopic views alluded to in the above testimonial were taken in company with the subscriber upon a recent trip to Niagara Falls along the south route of the Reading, Catawissa, Williamsport and Elmira Railroad to the Falls, with the addition of about twelve very interesting views of scenery in the coal regions near Pottsville the Mine Hill Railroad.

"These pictures are soon to be published upon glass and porcelain by an entirely new process. They are also to be published in a cheaper form upon albuminized paper, and may be had at the publication office of William Lloyd, 188 Chestnut Street, Philadelphia.

"The paper views will be sold in book form, and ready for sale on Friday at Cowperthwaite & Co., under the Masonic Hall, and Parry & McMullan, Fourth and Chestnut. (December, 1855.)"

A complete set of these early views of Philadelphia, either in hyalotype, lantern slides, or stereoscopic prints would be of great interest at the present day. An earnest



The first photo-mechanical reproduction. Made by Joseph Saxton, 1841.

search by the speaker, however, has failed to bring to light any but a few scattering specimens of Langenheim's scenic efforts.

I think that sufficient has been shown in the preceding remarks to prove that Philadelphia scientists from the very start have played an important part in the development of the photographic art-science, and that our fair city may well be called the birthplace of photographic portraiture as well as the mother city of modern photography.

In the development of the dry-plate industry Philadelphia also stands in the advance, the first commercial dry-plate in America having been made in this city. The

reputation of Philadelphia dry-plates and films are known throughout the photographic world.

In scientific research, it is but necessary to mention the names of M. Carey Lea and Frederick E. Ives, both I think members of this Institute; the latter being the inventor of the well-known half-tone process which bears his name, and more lately of a method for the projection of views in the colors of nature by strictly photographic means.

That in our generation the artists and professionals of our city have not deteriorated, is shown by the splendid achievements of Gutekunst and others of lesser renown, all proving themselves photographic artists second to none in the country.

In connection with my subject, I will also call attention that the first negative of a flash of lightning ever taken was made by Mr. W. N. Jennings, a member of this society, September, 1882, proving the fact that the electrical discharges from the clouds were wavy and not zigzag. This peculiar branch of scientific photography since its feasibility was shown by Mr. Jennings has developed into a wide-spread study. One of the most interesting results obtained by Mr. Jennings is the proof that lightning is oscillatory in character, by a series of fine photographs taken from a moving train, while crossing the prairie of North Dakota last summer.

In conclusion, I will call your attention to a few of the earliest heliographic experiments, contrasting them with the latest advances of the present period; these specimens will show the great strides which have been made during the past half a century.

LIST OF SPECIMENS REFERRED TO IN THE LECTURE AND
EXHIBITED.

(1) Fac-simile of Saxton's first effort at the Mint of the United States, October, 1839. Original deposited with the Historical Society of Pennsylvania.

(2) Contrast. An Ives heliochromoscope, showing the latest and highest development of the photographic art in the reproduction of the colors of nature.

(3) Fac-simile of the first portrait of the human face by any heliographic process, made by Robert Cornelius, November, 1839.

(4) Comparison: a portrait of the present day, made by Fred'k Gutekunst.

(5) Fac-simile of the first studio portrait, by Robert Cornelius, February, 1840.

(6) Fac-simile of the first instantaneous local views ever placed on exhibition or for competition, by Joseph E. Parker, March, 1840.

(7) Specimen of the earliest daguerreotype by the use of bromine, by Dr. Paul Beck Goddard, December, 1839.

(8) Fac-simile of the first photo-mechanical reproduction, made by Joseph Saxton in 1841.

(9) Specimen of the latest development of the photo-mechanical processes.

(10) Specimen daguerreotype for which Philadelphia became renowned, by Marcus A. Root.

(11) Specimen of earliest paper negative made by Francis Schreiber, Philadelphia, 1847.

(12) Contrast: a negative on flexible celluloid film.

(13) Specimen of photography or talbotype made from a paper negative about 1847. This is one of the earliest efforts at positive photography.

(14) Photograph, view of Fairmount Water Works. One of the earliest positives made from a glass negative. Made for exhibition at the World's Fair, London, 1851.

(15) Portrait of Joseph Saxton.

(16) Portrait of Frederick Langenheim, a talbotype from paper negative.

(17) Portrait of Francis Schreiber, the veteran photographer and co-worker with the Langenheim Brothers, at the age of ninety-one years.

(18) The complete studio outfit of Dr. Paul Beck Goddard, as used by him in 1840.

